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动物分类学报

THREE NEW SPECIES OF BRYOPHAENOCLADIUS THIENEMANN, FROM ORIENTAL CHINA, WITH INCONSPICUOUS INFERIOR VOLSELLA (DIPTERA, CHIRONOMIDAE)

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Abstract Three new species *Bryophaenocladius* with inconspicuous inferior volsella, *B. parimberbus* Wang *et* Du, sp. nov, *B. wufengensis* Wang *et* Du, sp. nov. and *B. xinglongensis* Wang *et* Du, sp. nov, are described as male imagines from China.

Key words Chironomidae, *Bryophaenocladius*, new species, inferior volsella

1 Introduction

Bryophaenocladius is one of the largest genera in Orthocladiinae. It was established by Thienemann in 1934, with *Orthocladius muscicola* Kieffer, 1906 as type species. The genus has nearly worldwide distribution, except for Australasian Region. To date 95 species have been recorded all over the world, but only 4 species were recorded in China, namely *B. aneiformis* Armitage, 1987, *B. propinquus* Brundin, 1947, *B. samiaus* Brundin, 1947 and *B. vernalis* Goetghebuer, 1921 (Freeman & Cranston, 1980; Ashe, 1983; Ashe & Cranston, 1990; Sasa & Kikuchi, 1995; Spies & Reiss, 1996; Wang, 2000; Chaudhuri *et al*., 2001; Wang *et al*., 2001; Wang *et al*., 2004; Yamamoto, 2004; Wang *et al*., 2006).

As one of the enigmatic orthoclad genera, *Bryophaenocladius* shows a large morphological variation among the species, especially in the male genitalia. Based on the material from China, in this paper, we describe three new species having inconspicuous inferior volsella.

2 Methods and Materials

The general morphological terminology follows Sæther (1980). Material examined is mounted on slides following the procedure outlined by Sæther (1969). Measurements are given as ranges followed by the mean, when three or more specimens are measured.

The type specimens are deposited in the College of Life Sciences, Nankai University, Tianjin, China (BDN).

3 Species Description

Bryophaenocladius parimberbus **Wang** *et* **Du, sp. nov.** (Figs 1 – 4)

Diagnostic characters. The present new species is characterized by the long anal point, the very small and generally neglected inferior volsella, the brown and yellow ribbon-liked abdomen and the sensilla clavata presenting on third palpal segment. The structure of inferior volsella and anal point is close to *B. inberbus*. But it can be separated by having seta in squama, the larger AR (1.62, 0.94 in *B. inberbus*) and much shorter costa extension (76 μm, 131 μm in *B. inberbus*).

Male imago (*n* = 4, except when otherwise stated).

Total length 3.02 – 3.13, 3.08 mm. Wing length 1.62 – 2.00, 1.79 mm. Total length/wing length 1.57 – 1.88, 1.73. Wing length/length of profemur 2.07 – 2.24, 2.16. Coloration dark brown. Thorax with dark brown stripes. Abdomen with dark brown bands (Fig. 1).

Head. AR 1.43 – 1.77, 1.62. Ultimate flagellomere with apical seta. Temporal seta 8 – 12, 10, including 4 – 6, 5 inner verticals, 2 – 4, 3 outer verticals, and 2 – 3, 2 postorbitals. Clypeus with 5 – 11, 8 setae. Tentorium 138 – 146, 143 μm long, 104 – 106, 105 wide. Palpomere lengths (in μm): 21 – 32, 26; 42 – 53, 49; 106 – 111, 109; 85 – 106, 98; 154 – 169, 159. Third segment with sensilla clavata and without fingerlike apical extension.

Thorax. Dorsocentrals 8 – 9, 9, antepronotals 2 – 3, 3; acrostichals 5 – 7, 6; prealars 3 – 3, 3; scutellum with 5 – 7, 6 setae. Humeral pits small rounded, brown.

Wing (Fig. 2). Anal lobe does not developed, with slight projection. Moderately coarse punctation easily visible at 100 × magnification. VR 1.12 – 1.14, 1.13. R_{2+3} ends 1/2 distance between R_1 and R_{4+5}. Costal extension 74 – 90, 82 μm long. Brachiolum

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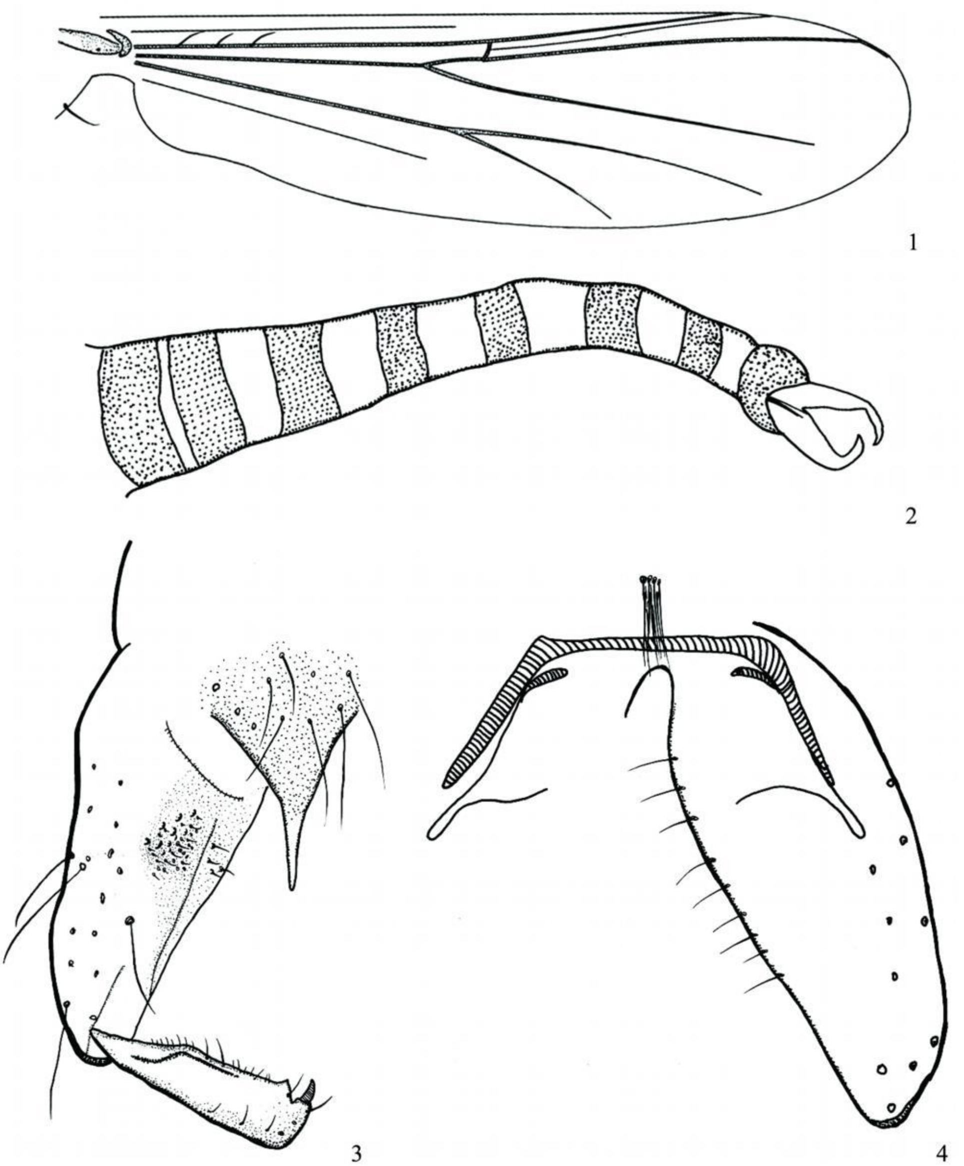
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Table 1. Arithmetic mean and range of the length (in μm) of legs of B. parinberbus new species

	p_1	p_2	p_3
fe	783–893, 828	777–861, 812	819–893, 849
ti	837–945, 893	735–861, 789	893–1 040, 955
ta_1	767–840, 791	441–494, 464	588–641, 610
ta_2	378–452, 410	210–243, 226	263–315, 385
ta_3	284–315, 294	162–189, 172	210–243, 229
ta_4	168–189, 179	105–126, 114	116–137, 126
ta_5	95–116, 105	54–84, 74	74–95, 84
LR	0.84–0.94, 0.89	0.57–0.60, 0.59	0.62–0.66, 0.64

with 1–2, 2 seta; R with 5–6, 6 setae; R_1 with 0 seta; remaining veins bare. Cu_1 slightly bended. Squama without seta.

Legs. Spur of front tibia 63 μm long ($n = 1$), spurs of middle 53–53, 53 μm and 11–32, 22 μm long of hind tibia 74–74, 74 μm and 32–42, 37 μm. Hind tibial comb with 11–13, 12 setae. All tibial spurs with normally developed denticles. Lengths and proportions of legs as in Table 1.



Figs 1–4 *Bryophaenocladius parinberbus* Wang *et* Du, sp. nov. 1. Wing. 2. Abdomen. 3. Hypopygium, dorsal view. 4. Hypopygium, ventral view.

Hypopygium (Figs 3–4). Anal point long and slim; 33–50, 41 μm long, 10–18, 14 μm wide. Anal point length/width: 2.78–3.30, 3.05. Tergite IX with 6–17, 12 setae; laterosternite IX with 4–7, 5 setae. Phallapodeme 64–78, 71 μm long; transverse sternapodeme 74–95, 82 μm long. Gonocoxite 200–221, 207 μm long. Inferior volsella very small. Gonostylus strongly bended, 95–107, 102 μm long.

with crista dorsalis. Megaseta 10–13, 12 μm long. Virga 25–38, 33 μm long. HR 1.87–2.24, 2.05, HV 2.88–3.27, 3.04.

Distribution. The species was collected from Henan and Shannxi Provinces in Oriental China, with the type localities 1 000–1 300 meters above sea level.

Etymology. The species is named after its resemblance with *B. inberbus*.

Holotype male, China, Henan Province, Luanchuan County, Longyuwan Forestry Centre, alt. 1 000 m, 1 July 1996, sweeping, LI Jun, slide no. 10316. Paratypes: 1 male, same data as holotype, slide no. 10250; 2 males, Shaanxi Province, Feng County, Qinling Mountain area, alt. 1 300 m, 19 July 1994, sweeping, JI Bing-Chun, slide nos. 04306, 04352.

Bryophaenocladius wufengensis **Wang et Du, sp. nov.** (Figs 5–7)

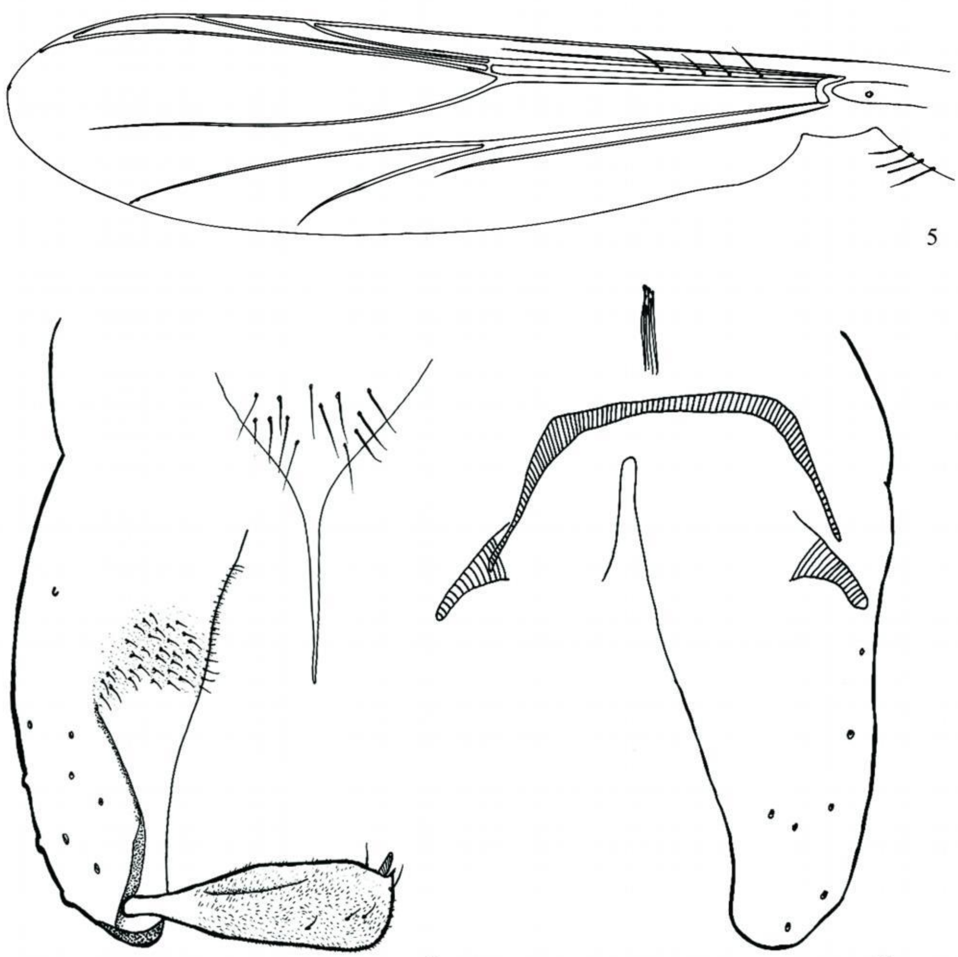
Diagnostic characters. The male imago is characterized by the absent setose inferior volsella, the developed crista dorsalis, the strong virga, the striped thorax and the banded abdomen.

Male imago (*n* = 3, except when otherwise stated).

Total length 2.88–3.38, 3.07 mm. Wing length 1.68–1.90, 1.79 mm. Total length/wing length 1.55–1.90, 1.72. Wing length/length of profemur 2.14–2.29, 2.21. Coloration yellow. Abdomen with darker pigment bands.

Head. AR 1.53–1.94, 1.68. Ultimate flagellomere without apical seta. Temporal seta 9–10, 9, including 4–6, 5 inner verticals, 1–4, 3 outer verticals, and 1–2, 2 postorbitals. Clypeus with 4–7, 5 setae. Tentorium 133–163, 149 μm long, 93–125, 110 μm wide. Palpomere lengths (in μm): 25–28, 26; 45–58, 49; 88–125, 107; 98–118, 110; 148–168, 159. Third segment without fingerlike apical extension, without sensilla clavata.

Thorax. Dorsocentrals 7–10, 9, antepronotals 2–3, 3, acrostichals 5–9, 7; prealars 3–3, 3. Scutellum with 4–5, 5 setae. Coloration with yellow and brown.



Figs 5–7. *Bryophaenocladius wufengensis* Wang *et* Du, sp. nov. 5. Wing. 6. Hypopygium, dorsal view. 7. Hypopygium, ventral view.

Wing (Fig. 5). Wing cuneiform. Anal lobe reduced. Moderately coarse punctation easily visible at 100× magnification. VR 1.09–1.17, 1.14. R_{2+3} ends 1/2 distance between R_1 and R_{4+5}. Costal extension 50–75, 63 μm long. Brachiolum with 1–1, 1 seta; R with 4–5, 4 setae; R_1 with 0 seta; remaining veins bare. Squama with 2–5, 4 setae.

Legs. Spur of front tibia 40–50, 47 μm long, spurs of middle 38–43, 40 μm and 23–30, 27 μm long, of hind tibia 55–73, 64 μm and 35–38, 37 μm. Middle tibial comb with 0 setae. Hind tibial comb with 11–13, 12 setae. All tibial spurs with normally developed denticles. Lengths and proportions of legs as in Table 2.

Table 2 Arithmetic mean and range of the length (in μm) of legs of *B. wufengensis* **new species**

	p_1	p_2	p_3
fe	760–830, 807	790–850, 820	800–900, 857
ti	800–870, 833	740–850, 793	850–1 000, 937
ta_1	490 (1)	380–500, 440 (2)	480–660, 570
ta_2	240 (1)	210–250, 230 (2)	250–310, 280
ta_3	180 (1)	160–190, 175 (2)	180–250, 215
ta_4	120 (1)	110–120, 115 (2)	120–140, 130
ta_5	80 (1)	60–80, 70 (2)	80–90, 85
LR	0.61 (1)	0.48–0.59, 0.54 (2)	0.50–0.71, 0.58

Hypopygium (Figs 6–7). Anal point long with tapering apex, 38–38, 38 μm long, 15–15, 15 μm wide. Anal point length/width 2.53–2.53, 2.53. Tergite IX with 9–14, 11 setae; laterosternite IX with 5–7, 6 setae. Phallapodeme 80–88, 83 μm long, transverse sternapodeme 75–88, 82 μm long, weakly arcuate without developed oral projection. Gonocoxite 205–238, 219 μm long. Gonostylus bended, 93–108, 100 μm long. Inferior volsella absent, setose in the area. Virga 38–62, 47 μm long, strong. Crista dorsalis prominent present near megaseta. Megaseta 10–13, 11 μm long. HR 2.13–2.20, 2.18, HV 2.95–3.13, 3.06.

Distribution. The species is known from the type locality in Hubei Province (Oriental China).

Etymology. Named after the type locality.

Holotype male, China, Hubei Province, Wufeng County, Houhe, 1 000 m, 10 July 1999, sweeping, JI Bing-Chun, slide no. 13979. Paratypes 2 males, same data as holotype, slide nos. 13981, 13951.

Bryophaenocladius xinglongensis **Wang et Du, sp. nov.** (Figs 8–10)

Diagnostic characters. The male imago is characterized by the unobvious and setose inferior volsella, short costa extension, the crista dorsalis present in the base of gonostylus, and the reduced number of setae on squama.

Male imago ($n = 2$).

Total length 1.86–1.89 mm. Wing length 1.00–1.03 mm. Total length/wing length 1.81–1.89 mm. Wing length/length of profemur 2.24–2.32. Coloration brown.

Head. AR 1.44–1.67. Ultimate flagellomere without apical seta. Temporal seta 7–8, including 4–4 inner verticals, 2–2 outer verticals, and 1–2 postorbitals. Clypeus with 6–8 setae. Palpomere lengths (in μm): 31–35; 26–30; 106–110; 86–90; 101–103. Third segment with fingerlike apical extension, with sensella clavata.

Thorax. Dorsocentrals 11–11; acrostichals 6–6; prealars 2–3; scutellum with 7–7 setae. Thorax brown.

Wing (Fig. 8). Anal lobe not developed. Moderately coarse punctation easily visible at 100× magnification. VR 1.15–1.31. R_{2+3} ends 1/2 distance between R_1 and R_{4+5}. Costal extension 10–12 μm long. Brachiolum with 1–1 seta, R with 3–5 setae, R_1 with 1–1 seta, remaining veins bare. Cu_1 bended. Squama with 2–3 setae.

Legs. Spur of front tibia 53–60 μm long, spurs of middle 37–43 μm and 12–16 μm long, of hind tibia 42–50 μm and 11–12 μm long. Middle tibial comb with 5–5 setae. Hind tibial comb with 10–11 setae. Tibial spurs with normally developed denticles. Lengths and proportions of legs as in Table 3.

Table 3 Arithmetic mean and range of the length (in μm) of legs of *B. xinglongensis* **new species.**

	p_1	p_2	p_3
fe	431–460	452–480	473–500
ti	483–530	441–500	525–570
ta_1	294 (1)	179–230	315–330
ta_2	168 (1)	95–130	158–170
ta_3	126 (1)	74–90	126–154
ta_4	84 (1)	53–65	63–80
ta_5	lost	53–60	53–75
LR	0.61 (1)	0.41–0.46	0.58–0.60

Hypopygium ($n = 1$) (Figs 9–10). Anal point triangular and broad, 25 μm long, 18 μm wide. Anal point length / width: 1.39. Tergite IX rectangular, with 10 setae; laterosternite IX with 10 setae. Phallapodeme 86 μm long, transverse sternapodeme 52 μm long. Arcuate with no developed oral projection. Gonocoxite 158 μm long. Gonostylus strongly bended, 6 μm long. Inferior volsella not obvious, setose. Virga 13 μm long. Megaseta 10 μm long. HR 1.84, HV 2.20.

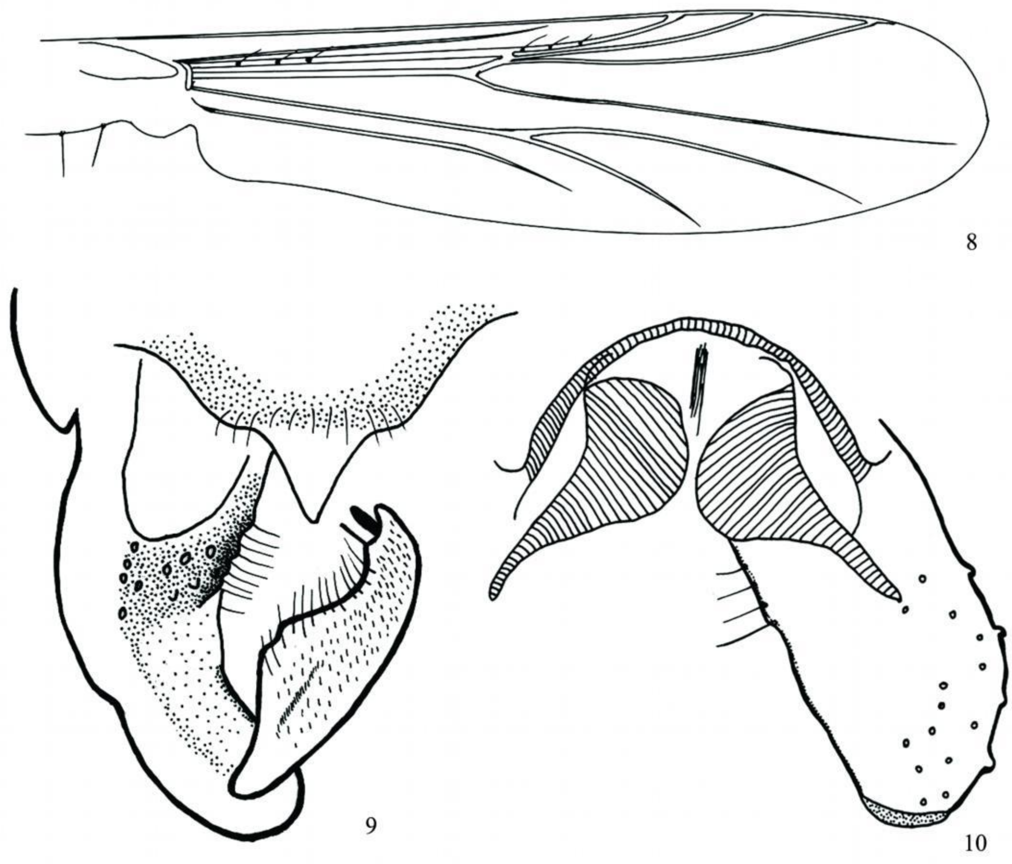
Distribution. The species is known from the type locality in Hainan Province (Oriental China).

Etymology. Named after the type locality.

Holotype male, China, Hainan Province, Xinglong Town, Huaqiao Farm, 21 May 1989, sweeping, WANG Xin-Hua, slide no. 1220. Paratype 1 male, same data as holotype, slide

no. 05784.

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Figs 8–10. *Bryophaenocladius xinglongensis* Wang *et* Du, sp. nov. 8. Wing. 9. Hypopygium, dorsal view. 10. Hypopygium, ventral view.

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中国苔摇蚊属具不明显下附器的三新种 (双翅目, 摇蚊科)

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摘 要 描述了苔摇蚊属具有不明显下附器的 3新种, 分别为拟裸须苔摇蚊 *Bryophaenocladius parimberbus* Wang *et* Liu, sp nov., 五峰苔摇蚊 *Bryophaenocladius wufengensis* Wang *et* Du, sp nov. 和兴隆苔摇蚊 *Bryophaenocladius xinglongensis* Wang *et* Liu, sp nov.。

拟裸须苔摇蚊, 新种 B. parimberbus **Wang et Du, sp. nov.** (图 1~4)

肛尖长, 下附器微小, 腹部具棕色和黄色带斑, 下颚须第 3节具感觉棒。下附器和肛尖的特征接近裸须苔摇蚊, 但是区别在于新种腋瓣有毛, AR 1.62, 较大于裸须苔摇蚊的 0.94, C脉延伸 76 μm, 短于裸须苔摇蚊的 131 μm。

正模 ♂, 河南栾川龙峪湾, 1 000 m, 1996-07-01, 李军扫网, 编号 10316。副模: 1 ♂, 同正模, 编号 10250; 2 ♂♂, 陕西省凤县秦岭, 1 300 m, 1994-07-19, 纪炳纯扫网, 编号 04306, 04352。

词源: 本种因近似裸须苔摇蚊 *B. imberbus* 而得名。

五峰苔摇蚊, 新种 B. wufengensis **Wang et Du, sp. nov.** (图 5~7)

鉴别特征 下附器缺失, 亚端背脊突出, 阳茎刺突强大, 胸部具条纹, 腹部具带状斑。

正模 ♂, 湖北省五峰县后河, 1 000 m, 1999-07-10, 纪炳纯扫网, 编号 13979。副模 2 ♂♂, 同正模, 编号 13981, 13951。

词源: 本种因其模式标本产地而得名。

兴隆苔摇蚊, 新种 B. xinglongensis **Wang et Du, sp. nov.** (图 8~10)

鉴别特征 下附器不明显, C脉延伸短, 亚端背脊存在于抱器端节基部, 腋瓣刚毛数减少。

正模 ♂, 海南省兴隆县华侨农场, 1989-05-21, 王新华扫网, 编号 1220。副模 1 ♂, 同正模, 编号 05784。

词源: 本种因其模式标本产地而得名。

关键词 摇蚊科, 苔摇蚊属, 新种, 下附器.
中图分类号 Q969.442.6

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